

# 2000-2001 NASA CONNECT SERIES OVERVIEW

## INTRODUCTION TO THE NASA CONNECT SERIES

NASA CONNECT is a series of 30-minute, instructional video programs for students in grades 5-8. Produced by the NASA Langley Research Center's Office of Education in Hampton, Virginia, the programs can be viewed live or taped for later use. NASA CONNECT is broadcast via Ku- and C-band satellite (television) and is web cast via the Internet through NASA's Learning Technology Channel. Many PBS-affiliated stations across the country carry NASA CONNECT. By using a steerable dish, the program can also be downlinked using the satellite coordinates posted on the NASA CONNECT web site.

Endorsed by the National Council of Teachers of Mathematics (NCTM), NASA CONNECT supports the national mathematics, science, and technology standards. Each NASA CONNECT program seeks to establish a "connection" between the mathematics, science, and technology concepts taught in the classroom and the mathematics, science, and technology used everyday by NASA researchers. By demonstrating the processes of creativity, critical thinking, and problem solving skills, NASA CONNECT enhances and enriches mathematics, science, and technology education.

The NASA CONNECT series can be easily integrated into an existing curriculum or used to introduce or reinforce a curriculum topic, objective, or skill. This introductory packet includes a six-step teaching protocol for the educator. Each NASA CONNECT program is accompanied by a lesson guide describing a hands-on classroom activity and web-based activity which complement and extend the lesson.

The American Institute of Aeronautics and Astronautics (AIAA) has agreed to provide classroom mentors to assist teachers with the student activities. Every effort will be made to match a teacher with an AIAA member who will assist the teacher either in person or by e-mail. To request a mentor, e-mail [nasaconnect@aiaa.org](mailto:nasaconnect@aiaa.org) or call Lisa Bacon at (703) 264-7527 at least four weeks prior to conducting the student activity.



Contact the AIAA to get a classroom mentor.

NASA CONNECT is FREE to educators. Register for NASA CONNECT on our web site (<http://connect.larc.nasa.gov>) or by phone (757-864-6100). Registered educators will receive, via e-mail, the date of upcoming shows, a show summary, and the lesson guide. NASA CONNECT is a U.S. Government product and is not subject to copyright. There are no fees or licensing agreements.

## THE 2000-2001 NASA CONNECT SERIES

Endorsed by the National Council of Teachers of Mathematics (NCTM), the 2000-2001 NASA CONNECT series uses proportional reasoning as the "integrative thread" that "connects" mathematics topics in each program.

The 2000-2001 NASA CONNECT series uses aeronautics and space technology (A-ST) as its organizing theme. This theme forms the creative basis for a series of five programs that demonstrate the problem-solving focus of NASA A-ST research. NASA A-ST goals are grouped into three areas or "Three Pillars": Global Civil Aviation, Revolutionary Technology Leaps, and Access to Space. These three pillars reflect national priorities for the NASA Aero-Space Technology Enterprise and require taking risks and performing the long-term research and development programs needed to keep the United States the global leader in aeronautics and space exploration.

## THE 2000-2001 NASA CONNECT PROGRAMS

### **MEASUREMENT, RATIOS, AND GRAPHING: 3, 2, 1...Crash!**

Thursday, October 19, 2000, 11:00 - 11:30 AM (EDT)

Crashing planes, skidding tires, and blasting water, NASA researchers work to improve airplane performance and safety.

Mathematics: measurement, ratios, graphing

Science: science and technology, science as inquiry, physical science

Technology: productivity tools, communication tools, research tools

NASA Research: Aircraft Landing Dynamics Facility (ALDF), Impact Dynamics

Research Facility (IDRF)

### **GEOMETRY AND ALGEBRA: Glow with the Flow**

Thursday, November 16, 2000, 11:00 - 11:30 AM (EST)

NASA aerospace researchers use models to see how air flows and why materials glow under wind tunnel conditions.

Mathematics: geometry, algebra

Science: physical science, science and technology, science in personal and social perspectives, science as inquiry

Technology: productivity tools, communication tools, research tools

NASA Research: Flow Visualization and Blended Wing Body (BWB)

### **PATTERNS, FUNCTIONS, AND ALGEBRA: Wired for Space**

Thursday, February 15, 2001, 11:00 - 11:30 AM (EST)

NASA researchers develop new ways to propel a spacecraft already in orbit without the aid of fuel.

Mathematics: patterns, functions, algebra

Science: physical science, Earth and space science, science as inquiry

Technology: productivity tools, communication tools, research tools

NASA Research: Propulsive Small Expendable Deployer System (ProSEDS)

### **DATA ANALYSIS AND MEASUREMENT: Ahead, Above the Clouds**

Thursday, March 15, 2001, 11:00 - 11:30 AM (EST)

Predicting severe weather, tracking clouds, and monitoring pollutants in the air, NASA scientists develop technologies to better understand our planet.

Mathematics: data analysis, measurement

Science: Earth and space science, physical science, science as inquiry, science and technology, science in personal and social perspectives

Technology: productivity tools, communication tools, research tools

NASA Research: Geostationary Imaging Fourier Transform Spectrometer (GIFTS)

### **FUNCTIONS AND STATISTICS: International Space Station (ISS): Up to Us**

Thursday, April 19, 2001, 11:00 - 11:30 AM (EST)

Ground research + space research = true science as international researchers anticipate working together onboard the ISS.

Mathematics: functions, statistics

Science: science and technology, Earth and space science, physical science, science as inquiry

Technology: productivity tools, communication tools, research tools

NASA Research: ISS

## **NASA CONNECT INSTRUCTIONAL PROGRAM**

Each program in the 2000-2001 NASA CONNECT series is designed to enhance and enrich the teaching of specific mathematics, science, and technology concepts. These programs are instructional in that they demonstrate the "how to" and the "real world" application and integration of mathematics, science, and technology. The NASA CONNECT instructional program has two objectives.

1. Students will be able to make connections between the mathematics, science, and technology taught in their classrooms and the real world applications by observing NASA researchers.
2. Students will be able to increase their understanding of mathematics, science, and technology concepts through interactive activities.

Each NASA CONNECT program models an instructional lesson design which includes an anticipatory set, explanation, questioning strategy, and interactive activities. Each NASA CONNECT program is supported by a lesson guide that provides a program summary and objectives, background information, relevant national mathematics, science, and technology standards, step-by-step instructions for conducting the activities, print and on-line resources, and suggestions for extending the activities.

### **ANTICIPATORY SET**

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Hosts and celebrity guests focus student attention, connect the program to past, present, or future learning, and visually and verbally present the learning objectives.

### **EXPLANATION**

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NASA engineers, scientists, and other expert guests illustrate the application and relevance of mathematics, science, and technology to the workplace. The connection is further established by introducing students to the tools and methods used by NASA researchers and other experts. Their contributions form the basis for the learning objectives.

### **QUESTIONING STRATEGY**

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Throughout the program, questions are posed to check for understanding and to give students time to process the mathematics, science, and technology concepts presented. Students record their answers on cue cards that are provided.

### **INTERACTIVE ACTIVITIES**

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The classroom and web-based activities are based on the national mathematics, science, and technology standards. These two interactive activities provide students the opportunity to connect the mathematics, science, and technology concepts learned in the classroom to the research presented by NASA engineers and scientists.

# NASA CONNECT TEACHING PROTOCOL

## INTRO TO NASA CONNECT TEACHING PROTOCOL

The model proposed to educators through the NASA CONNECT series introduces students to inquiry and the process of searching for patterns and relationships. The six-step teaching protocol below is designed to encourage the development of higher order cognitive skills and a more active mental engagement with the video program. Following this protocol enables students to make stronger connections between the NASA CONNECT program, the activities, and appropriate mathematics, science, and technology concepts.

The six-step protocol includes reflective discussion, student involvement, dialogue notes, the NASA CONNECT activity, journal writing, and the NASA CONNECT web site. The protocol, consistent with constructivist theory, promotes rich discourse among students. The proposed format is flexible and effective in enhancing students' understanding of complex mathematics, science, and technology concepts.

## STEPS IN NASA CONNECT TEACHING PROTOCOL



### STEP 1: REFLECTIVE DISCUSSION

Prior to viewing the NASA CONNECT program, list and discuss questions and preconceptions that students have about the program topic. Keep these questions on the board during the video. In addition to helping students prepare for the program, these questions can also serve as a pretest for assessment purposes. The following is a sample of teacher-directed questions:

1. What role does mathematics play in science?
2. What kinds of mathematics, science, and technology do NASA experts use in their research?
3. What other skills are necessary to conduct research?
4. Of what value are collaborations and partnerships in conducting research?



### STEP 2: STUDENT INVOLVEMENT

NASA CONNECT is not designed for passive viewing. NASA CONNECT actively engages students throughout the program. The following suggestions are provided to help teachers focus student attention on the major concepts presented in the video.

#### Cue Cards

Cue Cards have selected questions that focus on the critical elements in each video segment. Teachers should copy the Cue Cards from the lesson guide and distribute them prior to viewing the video. Students are encouraged to take notes during the video and answer the questions on the cards. In addition, educators may want to use Norbert's pause.

#### Norbert's Pause

If students view a videotaped version of NASA CONNECT, educators have the option to pause the videotape. Norbert, the animated cohost of NASA CONNECT, appears with a remote to indicate an appropriate time to pause the videotape. The pause creates an opportunity for student reflection and discussion.



### **STEP 3: DIALOGUE NOTES**

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Immediately following the video, students should spend five to ten minutes reviewing the questions in "Step 1: Reflective Discussion Section." Teachers should ask students to give examples from the video presentation that support their responses to each question.

Review the Cue Cards with students. Teachers should ask students to share what they recorded and learned from each guest and NASA researcher. Students should also discuss what they believe are the important mathematics, science, and technology concepts these individuals use in their work.



### **STEP 4: NASA CONNECT ACTIVITY**

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Students learn from direct teaching, engaging in classroom discussion, conducting research, and taking notes. The teacher-tested classroom activity is designed to enhance mathematics and science concepts. Students are assigned to cooperative groups and use everyday objects to complete the activity.

When using the NASA CONNECT classroom activity, refer to the lesson guide. Introduce students to the vocabulary, guide students toward connections, explore possible misconceptions associated with the topic, conduct the activity, and conclude by analyzing the data. Finally, have students relate the results of the activity to the NASA research presented in the video.



### **STEP 5: JOURNAL WRITING**

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Journal writing supports students' reflective thinking processes. Students should reflect on what they learned from the video and from their own experimentation. Educators can ask students questions that relate to the application of mathematics, science, and technology concepts presented in the video to real-life situations. Educators might use journal questions to assess student understanding of the concepts presented in the lesson guide.



### **STEP 6: NASA CONNECT WEB**

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The web site uses the inquisitory instruction strategy to place students in a contextual environment and encourages them to understand the mathematics, science, and technology concepts and skills presented in the program. The web site also presents multiple perspectives to specific questions raised in the video. A series of activities is incorporated into the NASA CONNECT web site for each program to augment the video theme and to provide additional opportunities for students to perform multiple trials and share their data with others. Teachers might use this site to establish a connection between the classroom and the family by sending home a notice about the NASA CONNECT program and its Internet URL and by encouraging parents to explore this site and complete the activities with their children.

## NASA RESOURCES FOR EDUCATORS

NASA's Education Home Page (<http://education.nasa.gov>) serves as the cyber-gateway to information regarding educational programs and services offered by NASA for educators and students across the United States, and provides specific details and points of contact for all of NASA's educational efforts and Field Center Offices. Those utilizing the site will have access to a comprehensive overview of NASA's educational programs and services, as well as home pages offered by NASA's four areas of research and development

NASA Langley Research Center, Office of Education (<http://edu.larc.nasa.gov>) offers a wide variety of opportunities for educators at all levels of instruction. The Office of Education seeks to enhance the teaching of mathematics, science, and technology through its distance learning programs, all of which are described on the web site. Educators can also search NASA educational resources for the classroom including activities, curriculum enhancing projects, and equipment. From this site, you can link to our NASA CONNECT web site.

NASA Spacelink (<http://spacelink.nasa.gov>) is one of NASA's electronic resources that is specifically developed for use by the education community. This comprehensive electronic library offers teacher guides, wall sheets, listings of videos, computer software, and other materials that have been developed to meet national education standards. Educators can search specific curriculum materials by grade level and subject matter. Current and historical information related to NASA's aeronautic and space research can be found on Spacelink. Links to NASA Educator Resource Centers (ERCs), the Central Operations of Resources for Educators (CORE), news releases, current state reports on agency projects and events, and television broadcast schedules for NASA Television are also provided.

Quest (<http://quest.nasa.gov>) is the home of NASA's K-12 Internet initiative. This electronic resource specializes in providing programs, materials, and opportunities for teachers and students to use NASA resources as learning tools to explore the Internet. One of its unique projects is *Sharing NASA*, a series about on-line, interactive units where students can communicate with NASA scientists and researchers to experience the excitement of real science in real time. The Learning Technologies Channel (LTC) (<http://quest.nasa.gov/ltc/>) is a NASA location on the Internet that allows you to participate in on-line courses and to remotely attend some NASA workshops and seminars. A primary focus of the LTC is to broaden the uses of the Internet to include in-service teacher training and to bring new Internet experiences into the classroom.

NASA CORE, Central Operation of Resources for Educators (<http://core.nasa.gov>) is a worldwide distribution center for NASA multimedia educational materials. Educational materials include videotape programs, slide sets, and computer software. For a minimal fee, NASA CORE will provide educators with materials through its mail order service. A free NASA CORE catalog is available.

NASA CORE  
15181 State Route 58 South, Oberlin, OH 44074,  
phone: (440) 775-1400, fax: (440) 775-1460, E-mail: [nasaco@leeca.org](mailto:nasaco@leeca.org)

## EDUCATOR RESOURCE CENTERS (ERCs)

The NASA Educator Resource Centers' Network (<http://education.nasa.gov/ercn>) is composed of Educator Resource Centers located at or near all NASA installations. ERCs are located at planetariums, universities, museums, and other nonprofit organizations nationwide. These centers supply instructional activities, videotapes, slides, and computer software generated by NASA programs, technologies, and discoveries. These materials are designed for educators of all disciplines and are aligned to the national education standards.

For more information on NASA education programs and aeronautics-related materials, educators may contact the ERC at the following NASA Centers. The NASA field centers that have leading roles and responsibilities in Aero-Space Technology (A-ST) research are in **boldface**.

AK, Northern CA (southern-most counties of Inyo, Kings Monterey, Tulare), HI, ID, MT, NV, OR, UT, WA, WY

### **NASA Ames Educator Resource Center**

Mail Stop 253-2  
Moffett Field, CA 94035-1000  
(650) 604-3574  
<http://ccf.arc.nasa.gov/dx/basket/trc/trchome.html>

AZ, Southern CA (northern-most counties of Kern, San Bernadino, San Luis Obispo)

### **NASA Dryden Educator Resource Center**

45108 North Third Street East  
Lancaster, CA 93535  
(661) 948-7347  
<http://www.dfrc.nasa.gov/trc/ERC>

CA

NASA JPL Educator Resource Center  
Village at Indian Hills Mall  
1460 East Holt Blvd., Suite 20  
Pomona, CA 91767  
(909) 397-4420  
<http://eis.jpl.nasa.gov/eao/>

CT, DE, DC, ME, MD, MA, NH, NJ, NY, PA, RI, VT

NASA Goddard Educator Resource Center  
Mail Code 130.3  
Greenbelt, MD 20771  
(301) 286-8570  
<http://pao.gsfc.nasa.gov/gsfcc/educ/trl/welcome.html>

VA's and MD's Eastern Shore

NASA Wallops Educator Resource Center  
Education Complex - Visitor Center  
Building J-17  
Wallops Island, VA 23337  
(757) 824-2298

FL, GA, Puerto Rico, Virgin Islands  
NASA Kennedy Educator Resource Center  
Mail Code ERC  
J.F. Kennedy Space Center, FL 32899  
(407) 867-4090

CO, KS, NE, NM, ND, OK, SD, TX  
Johnson Space Center  
1601 NASA Road One  
Houston, TX 77058  
(281) 244-2129  
<http://www.jsc.nasa.gov>

KY, NC, SC, VA, WV  
**NASA Langley Educator Resource Center**  
Virginia Air and Space Center  
600 Settlers Landing Road  
Hampton, VA 23669  
(757) 727-0900, ext. 757  
<http://www.vasc.org/erc>

IL, IN, MI, MN, OH, WI  
**NASA Glenn Educator Resource Center**  
21000 Brookpark Road, MS 8-1  
Cleveland, OH 44135  
(216) 433-2017  
<http://www.grc.nasa.gov/WWW/PAO/html/edteachr.htm>

AL, AR, IA, LA, MO, TN  
**NASA Marshall Educator Resource Center**  
U.S. Space and Rocket Center  
One Tranquility Base  
Huntsville, AL 35758  
(256) 544-5812  
<http://www1.msfc.nasa.gov/education/erc>

MS  
NASA Stennis Educator Resource Center  
Building 1200  
Stennis Space Center, MS 39529  
(228) 688-3220  
<http://education.ssc.nasa.gov/htmls/trc/trc.htm>